

Title

Graphics Processing Unit Assisted Thermographic Compositing

Center Point of Contact

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Objective

To develop a software application utilizing general purpose graphics processing units (GPUs) for the analysis of large sets of thermographic data.

Background

Over the past few years, an increasing effort among scientists and engineers to utilize the GPU in a more general purpose fashion is allowing for supercomputer level results at individual workstations. As data sets grow, the methods to work them grow at an equal, and often great, pace. Certain common computations can take advantage of the massively parallel and optimized hardware constructs of the GPU to allow for throughput that was previously reserved for compute clusters. These common computations have high degrees of data parallelism, that is, they are the same computation applied to a large set of data where the result does not depend on other data elements. Signal (image) processing is one area where GPUs are being used to greatly increase the performance of certain algorithms and analysis techniques.

Technical Methodology/Approach

Apply massively parallel algorithms and data structures to the specific analysis requirements presented when working with thermographic data sets.

Benefits/Payoffs

The end product of this effort is a software application that utilizes general purpose graphics processing units to allow the analysis of large thermographic data sets. This would also allow the use of previously

unavailable computationally intensive analysis techniques, higher resolution thermographic cameras, and larger individual data files.

Customers

All projects that utilize flash thermography for the inspection of composite aerospace structures.

Recent Accomplishments (2010)

The focus for this period was the on the problem clarification, specifically, what hardware or software components were limiting factors in the analysis of large thermographic data sets. A literature survey was performed to determine what parallel algorithms could be implemented on the GPU to allow for increase analysis capabilities. Additionally, survey results yielded optimizations for the current CPU benchmarking implementation that will allow for future comparative results.

Recent Accomplishments (2011)

Continue the survey of available literature to determine applicable algorithms, optimizations and techniques for increasing the performance of signal processing using the GPU. Build a demonstration application to directly compare the performance of corresponding algorithms on the CPU and GPU.

Future Work (2012)

Build a software application that is capable of visualizing large thermographic data sets in a grid layout and performing analysis operations on the data set as a whole.